Journal of the Royal Society of Arts

NO. 4916 FRIDAY, 8TH JANUARY, 1954 VOL. CII

FORTHCOMING MEETINGS

WEDNESDAY, 13TH JANUARY, AT 2.30 p.m. '*Stereo-Cinematography*', by Leslie Knopp, Ph.D., M.Sc., Technical Adviser, Cinematograph Exhibitors' Association of Great Britain and Ireland. Sir Henry French, G.B.E., K.C.B., Director-General, British Film Producers Association, will preside. The paper will be illustrated with lantern slides.

THURSDAY, 14TH JANUARY, AT 5.15 p.m. COMMONWEALTH SECTION. HENRY MORLEY LECTURE. '*The Colombo Plan*', by A. C. B. Symon, C.M.G., O.B.E., Assistant Under-Secretary, Commonwealth Relations Office. Sir Percival Griffiths, C.I.E., Honorary Adviser to the India, Pakistan and Burma Association, will preside. (Tea will be served from 4.30 p.m.)

WEDNESDAY, 20TH JANUARY, AT 2.30 p.m. '*The Dodo and the Phoenix: the Royal College of Art Since the War*', by Robin Darwin, C.B.E., Hon. A.R.C.A., Principal, Royal College of Art. Sir Griffith Williams, K.B.E., C.B., a member of Council of the Society, will preside.

WEDNESDAY, 27TH JANUARY, AT 2.30 p.m. '*Furnishing Fabrics of the Past 200 Years*', by Sir Ernest Goodale, C.B.E., M.C., Chairman and Managing Director, Messrs. Warner & Sons, Ltd. Professor A. E. Richardson, R.A., F.R.I.B.A., a member of Council of the Society, will preside. The paper will be illustrated with examples of fabrics.

WEDNESDAY, 3RD FEBRUARY, AT 2.30 p.m. '*The Evolution of Public Health Engineering*', by F. E. Bruce, M.Sc., S.M., A.M.I.C.E., Reader in Civil Engineering, Imperial College of Science and Technology. G. M. McNaughton, C.B., B.Sc., M.I.C.E., Chief Engineer, Ministry of Housing and Local Government, will preside.

OFFER OF ENDOWED PRIZES, 1954

The Royal Society of Arts, as trustee for the undermentioned endowments, offers the following prizes during the year 1954:

BENJAMIN SHAW PRIZE FOR INDUSTRIAL SAFETY

The Benjamin Shaw Trust was founded in 1876 'for the promotion of improve-

ments in all matters relating to unhealthy and dangerous occupations', a subject in which the Society has taken a practical interest ever since its foundation in 1754. A prize of £20 is offered in 1954 in accordance with the terms of the Trust 'for any discovery, invention, or newly devised method of obviating, or materially diminishing any risk to life, limb or health, incidental to any industrial occupation, and not previously capable of being so obviated or diminished by any known and practically available means'.

Entries may be in the form of descriptive essays or models.

FOTHERGILL PRIZE FOR FIRE PREVENTION OR FIRE-FIGHTING

Under the Fothergill Trust (established by the will of Dr. Fothergill in 1821) a prize of £20 is offered in 1954 for a descriptive essay or model embodying some new idea for the prevention or suppression of fire.

HOWARD PRIZE FOR MECHANICAL MOTIVE POWER

The Howard Trust was established in 1868 for the purpose of making awards periodically to the authors of treatises on steam or other motive agents, and a prize of £20 is offered in 1954 to the author of a treatise on some aspect of the subject of mechanical motive power.

Conditions of Entry

(1) Entries for the above prizes must be received by the Secretary of the Society not later than 31st July, 1954, and must be clearly marked with the entrant's name and address and the prize for which they are submitted. Essays must be typewritten.

(2) The Society cannot accommodate bulky apparatus for judging. Such entries must be submitted by means of written descriptions or models, but the Society may subsequently require a demonstration with the actual apparatus.

(3) The Society reserves the right to divide or withhold all or any part of the above prizes, should the quality of the entries, in the opinion of the judges, justify such a course.

(4) The Society reserves the right to exhibit or publish any entries (the copyright being retained by the competitor).

(5) The Society cannot accept any responsibility for the safety of any papers or models submitted to it for the purpose of these awards.

(6) The decision of the Council of the Society regarding all matters connected with the awards will be final and correspondence cannot be entered into regarding the reasons for any decisions it may take.

RECORDINGS OF THE INAUGURAL MEETING

A tape-recording was made of the proceedings at the Inaugural Meeting of the 200th Session on 18th November, and the Chairman's address of welcome to the President and His Royal Highness's reply are now being transferred to discs. A limited number of copies of this record, which will be in the form of a normal double-sided 12-inch gramophone record (78 r.p.m.), can be supplied to Fellows. The price is 7*s.* 6*d.*, including packing and postage, and orders, with a remittance, should be sent as soon as possible to the Secretary.

In order to give overseas Fellows an opportunity, a certain number of records will be reserved for them in the first instance, but they are asked to make application without delay.

THE ASCENT OF EVEREST

Thomas Holland Memorial Lecture by

WILFRID NOYCE, M.A.,

a member of the 1953 expedition, delivered at a Joint Meeting of the Commonwealth Section and the East India Association, on Tuesday, 15th December, 1953, with Sir Harry Lindsay, K.C.I.E., C.B.E., a Vice-President of the Society, in the Chair

THE CHAIRMAN: This is the Everest day at the Royal Society of Arts, and it is also rather a special occasion, because Mr. Wilfrid Noyce, one of the heroic team who conquered Everest, is to give us the Thomas Holland Memorial Lecture. This lecture is an annual one, the third of the series; it was founded in honour of the late Sir Thomas Holland, who was for many years a member of Council of this Society, and was also a Chairman of the Society; he is represented to-day by his daughter, Mrs. Shea.

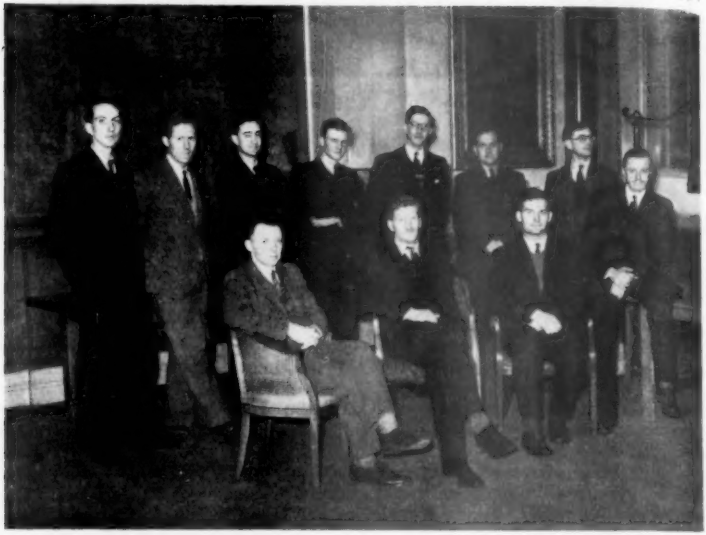
Before I actually introduce our speaker this evening, I am going to indulge, for two minutes, in a little personal reminiscence. I remember once, many years ago, in fact within a couple of years of beginning my service in India, an occasion when I was serving on famine relief duty in the Darbhanga district of Bihar. On that particular evening, after a day of very heavy rain, I was standing on the spoil bank of one of the relief works, looking at a vast mass of Indian peasants doing relief work. By my side was one of my Indian foremen; he began to look rather agitated, and I asked what was wrong. He pointed to the horizon and he said: 'Look, Sahib!' I strained my eyes, but could see nothing. Then I strained them a little more, and there it was: a rose-red triangle hanging between heaven and earth. The foreman was terribly moved; he was obviously thinking of the divinity of the mountain, and he made a remark which impressed me with something of his own emotion: 'Sahib, you might stand with me on this little hill for ten years, and not see the sight which you have seen to-day'. That was my first view of Everest and it has remained in my mind ever since.

That is the little personal reminiscence, and I now come to my main task this evening, which is to introduce our lecturer to you. I am not going to say much about him because you know all about him already. He is a member of that great team which conquered Everest, he is a Master of Charterhouse, with a long record of mountaineering behind him, and I shall now leave him to speak for himself.

The following lecture, which was illustrated with lantern slides, was then read:

THE LECTURE

I must confess great diffidence in giving this lecture before so learned a company. When I was asked to join the Everest Expedition and contemplated the scientific qualifications of the others, I found myself very much a goose among swans. Fortunately everybody was extremely nice about this; but you must be patient with me, regarding me as no scientific mountaineer, no de Saussure or Tyndall, only an unscientific man with a grateful heart, raised on the metallic wings of the goddess to the slopes of Everest above the South Col.



[By permission of 'The Times'

Some members of the Expedition photographed before setting out, at the Headquarters of the Royal Geographical Society in London. Standing left to right: Mr. H. A. Rawlinson (reserve), Dr. L. G. C. Pugh, Major C. J. Wylie, Mr. C. W. F. Noyce, Mr. G. C. Band, Mr. J. A. Jackson (reserve), Mr. M. Westmacott. Seated left to right: Dr. R. C. Evans, Colonel Sir John Hunt (leader), Mr. T. D. Bourdillon, Mr. A. Gregory. Members not in the photograph are: Dr. M. Ward, Mr. J. H. Emlyn Jones (reserve), Mr. H. Nichol (reserve), Sir Edmund Hillary and Mr. G. Lowe (New Zealand).

When we assembled on 17th November, 1952, the result of the Swiss second attempt was not known. Some of the party that John Hunt had invited to make up our expedition are shown in the photograph. Charles Evans is a brain surgeon, a job he fortunately did not have to exercise on the mountain, and he was in charge of the packing and stores. Tom Bourdillon is a research scientist and was in charge of the oxygen. George Band, a geological student, looked after wireless and meteorology, as well as helping with the food, the least popular task of all. Michael Westmacott, a statistician who had also been a sapper, ordered our tents and bridging apparatus. Gregory is a photographic expert as well as the director of a travel agency, and was in charge of still photography, while Thomas Stobart looked after the film. Edmund Hillary regards bee-keeping with a scientific eye, and the remaining members of the climbing party, George Lowe, a school teacher, and Charles Wylie, a Gurkha officer, both had a meticulous thoroughness about them which I could only admire. Our doctor was Michael Ward, and it must be said at once that the health of the party was excellent; although poor Mike was always gently teased for two stock remedies when people were sick high up.

The first was 'go down lower', and the second, if he did give you a pill, was always said to be: 'Try this, it's no use at all'. Besides these men, we had Dr. Griffith Pugh, a research physiologist. My impression of him, not altogether wrong, was that he would lurk at the top of the ice fall, and when you heaved yourself exhausted out of it would make you jump up and down on to a box in order that he might tell you in scientific terms that you were exhausted.

Our expedition added the last block, as it were, to the pyramid of experience built up on Everest before. Our equipment and approach were an improvement on previous efforts, just as the French would have improved on us, had they had the chance, in 1954. From 10th December, literally thousands of people were set working on our needs. Our wind-proof clothing was of special cotton nylon tested in wind chambers, and the tents, Meade, pyramid and dome, were of the same. Our down clothing, a notable success, was made for us in France. Climbing into it was like enveloping oneself in three eiderdowns. Our staple food, of which Pugh was in chief command, was army tinned 'compo' ration, giving a good and meaty, though faintly monotonous diet. The assault rations were a new toy, specially vacuum-packed in boxes containing one-man-day. They gave fourteen ounces of sugar, some grape-nuts, some pemmican soup, cheese, biscuits, jam, sweets, lemonade powder, tea and coffee or cocoa. The only trouble in practice was that we had too large appetites for them. Hence the frequent wireless messages from the Lhotse face: 'Why are you sending up all this oxygen? We want some tins of *meat*'.

[By permission of the Himalayan Committee of the R.G.S. and the Alpine Club of Great Britain

Tents and down clothing at Camp 4

Our wireless was made by Pye and consisted of a receiving set and walkie-talkie apparatus, invaluable for communicating between camps. Of the elaborate medicine chest, Mike Ward was in charge. Our boots were of two kinds, a general purpose boot for use up to Advance Base at 21,200 feet, and a special high altitude boot built for very short duration and only to be used above. This looked like an elephant's foot, and to put on it had the feel of enveloping the foot in eiderdown. Though inevitably clumsy, it was extraordinarily warm, and never stiffened with cold; I never suffered from cold feet. Finally, our oxygen: this also was of two kinds. One was an open-circuit apparatus in which the air breathed out is lost; this type had been used before. The other was an experimental set, on the closed-circuit principle worked out by Tom Bourdillon and his father. In this the air breathed out is reconverted by a soda-lime canister, so that the climber breathes pure oxygen; provided all goes well with the apparatus, his efficiency is much higher than with the open-circuit.

The months of November, December and January were spent testing equipment, getting it ordered and prepared by firms and finally sorted and packed. We all had our jobs. I was in charge of climbing equipment, ropes, ice axes and the like: also, on the strength of a three-day course in London, I was boot repairer, and I helped Charles Evans over packing. Being a writer, I also helped John Hunt with the dispatches. On 12th February nearly eight tons of baggage, consisting of five hundred oddly shaped packages, left England with the main party on the S.S. *Stratheden*. We arrived at Bombay on the 28th, and there followed the tiresome journey, of which I was in charge, across India. Our packages must be trans-shipped three times on to railways of three different gauges; taken by lorry twenty-five miles inside the Nepalese frontier; and finally swung a further twenty miles on the hazardous-looking rope railway across two six-thousand-foot ridges and down to Katmandu, the capital of Nepal. On 8th March the whole party was assembled for the first time, Hillary and Lowe having joined us from New Zealand and Tenzing from Darjeeling.

I shall pass rapidly over the march, a glorious seventeen days cutting across the valleys of Nepal, walking almost due east, until we turned north up the Dudh Kosi, the river which drains the Everest ranges. The way was enlivened by scarlet rhododendrons cloaking the slopes, by tree magnolia, whose great waxy flowers appeared like starry clusters against the dark hillsides, and by the almond and pear blossom in the lower valleys. The butterfly hunters, John Hunt and Mike Westmacott, had a fine field of activity. Mike managed to capture forty different species. The most serious aspect of the march was the getting of over 350 coolies, carrying our loads, from Katmandu to Base Camp. For this Charles Wylie, as transport officer, was responsible, and his knowledge of Nepali, as well as his popularity with everybody, were quite priceless. To look a little less like an army we marched in two parties, one a day behind the other. Charles led the second party with two hundred of the coolies.

On 26th March we arrived at our first base camp, near the monastery of Thyangboche. This is quite the loveliest place that I have ever seen. Green grass meadows are fringed by woods of pine, silver birch and juniper in which

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Porters on the march

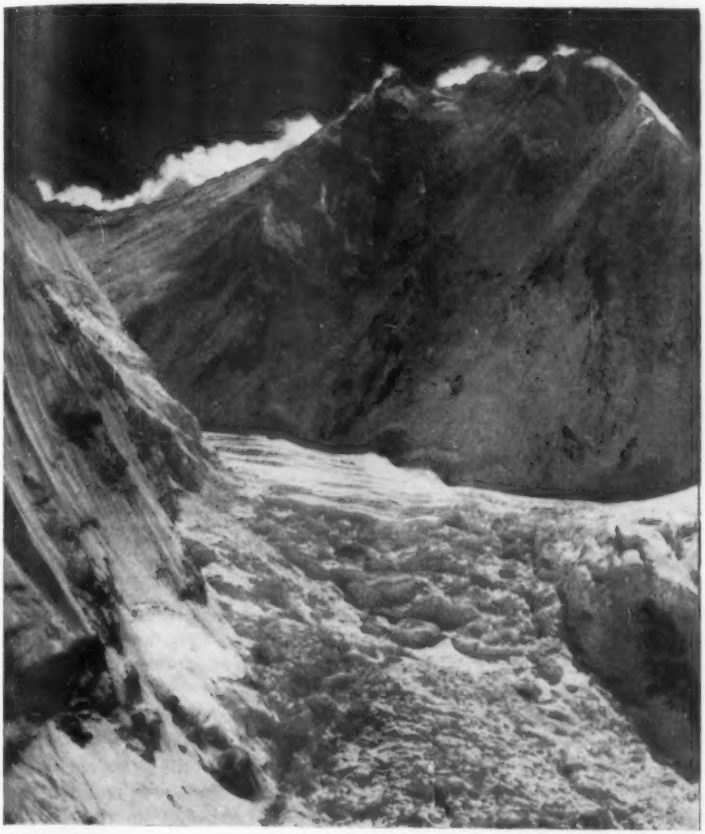
the musk deer wander freely. The whole is backed by the tremendous precipices and serrated ice ridges of Everest's satellites. The lamas of the monastery entertained us to tea, and with stories of that interesting gentleman, the 'yeti' or abominable snowman. In the winter these creatures are seen near the monastery, playing in the snow. They kill yak, which they skin carefully, and plant the horns in the ground. We are all firm believers in their existence.

To be thinking of Everest here seemed as sacrilegious as to be planning gas warfare in the Garden of Eden. I wanted just to lie on the green grass and contemplate. However, there was much to do, stores to be unpacked and sorted, Sherpas to be fitted with climbing equipment, boots and windproof clothing, and plans to be made for the next three weeks. We were still too early for Everest, and John Hunt's plan was to spend three weeks acclimatizing on the mountains around. Everybody, going high for the first time in the season, is liable to suffer from forms of mountain sickness: headaches, vomiting, loss of appetite, and panting. With many people this happens most acutely between 15,000 and 17,000 feet. By spending three weeks getting used to our climbing equipment, ourselves and our Sherpas, we should arrive at Base Camp fit and ready for the mountain. We would also have all had a spell on oxygen. Some of the Sherpas were to be trained in this. These men, the carriers *par excellence* of Himalayan mountaineering, had joined us from Darjeeling and Namche Bazar, their home town just short of Thyangboche. Thirty-four of them, under the leadership of Tenzing, were equipped to go high.

The second 'acclimatization period', starting on 10th April and spent by most of us in small parties exploring, was given to one party for a preliminary look at the icefall of Everest. On 13th April Hillary, Band, Lowe and Westmacott first set foot on the icefall at the head of the main Khumbu glacier. The photographs show that our problems on Everest were divided into three distinct stages. First was the icefall, negotiated by Eric Shipton in 1951. Up this huge, moving maze we must transport not only ourselves but three tons of equipment into the western Cwm of Everest by the middle of May. The Cwm was so named by George Mallory who saw into it from the Tibetan border, and must be one of the strangest valleys of the world. It is flanked on the right by the immense yellow granite buttresses of Nuptse, a ridge several miles long and nowhere lower than 25,000 feet, which leads to Lhotse, the south peak of Everest, 27,890 feet. On the north the Cwm is bounded by the west shoulder of Everest and the 7,000-foot precipice rising to the summit itself. When we had reached Advanced Base near the head of this valley, our second problem would be the climb to the South Col, the 26,000-foot gap between Everest and Lhotse. The third problem would be the south-east ridge.

Hillary's party found the icefall more intricate than two years previously. It is a mass of enormous blocks slowly nosing its way down to the Khumbu glacier. A way must be found which is not only climbable but which can be made safe for laden porters traversing it day after day. By the 19th April, a great piece of work, the party had reached the top of the icefall and a tentative Camp 3 was established. Camp 2 was on an uncomfortable shelf near two large ice towers about half way. A number of days were spent making the route safe: I well remember pulling down one *serac* or ice tower, with a rope round it as one pulls down a tree; and chipping away at the base of another until it was possible to batter it down, using an eight-foot pole as a ram. Besides this large steps were cut—though all wore 'crampons' or ice-claws—log bridges and ropes were fixed. It was amusing to see how cautiously the Sherpas crawled over these bridges to begin with; later on, their natural gaiety prevailing, they would career over them upright, and when one of them looked like falling in he was greeted by roars of laughter from his comrades.

On the 24th April a regular ferry service started. All this time and till 14th May, we were having regular afternoon snowfalls. Parties of some eight Sherpas led by a climber (and Tenzing was, of course, counted as a climber) went up with loads to Camp 2 one afternoon. Next morning they would go on to Camp 3, dump their loads and return to Base Camp that day. Towards the end, Camp 2 became so unpopular because of the subterranean noises and the holes that used to appear from nowhere outside tent doors, that the Sherpas insisted on abandoning it and doing the carry to Camp 3 in one day. If you reckon Base Camp at 17,900 feet, Camp 2 19,600 feet, and Camp 3 20,500 feet, this was no mean effort. Meanwhile another party, consisting, at the end of April, of Gregory and myself with seven Sherpas, stayed at Camp 3 to carry the loads on for the three and a half hours' journey to Advance Base or Camp 4. On 18th May the last load came up from Base. Thereafter the whole expedition was



[By permission of the Himalayan Committee of the R.G.S. and the Alpine Club of Great Britain

Khumbu Icefall

self-supporting at Camp 4. J. Roberts had appeared with our main supply of oxygen.

I once met Griffith Pugh on his way up the icefall. He took longer to acclimatize than most, but he was struggling gallantly up to do some scientific experiments at Camp 3. Unfortunately, when he opened his box and felt for the precious test tubes, he discovered to his horror that it was not his box at all but an exactly similar one, out of which he drew bottle after bottle of mango chutney. Poor Griff. He was subsequently rewarded at Camp 4 by being allowed to weigh us, and to make some victims step up and down on to packing cases, breathing the while into Douglas bags. He also removed a small amount of

[By permission of the Himalayan Committee of the R.G.S. and the Alpine Club of Great Britain

Crossing a crevasse in the Icefall by ladder

blood from our thumbs. This he pipetted on to circles of blotting paper, so that each could go and admire his particular hue. Our blood up here was a very dark maroon colour, and it was interesting to notice, when he repeated the test down in the valley later, how quickly it returned to normal red.

When Gregory and I were staying at Camp 3, it seemed very high. We were afraid of loss of appetite, sleeplessness and so forth. By the time we were all established at Advance Base, 21,200 feet, we were all eating like horses and sleeping like the proverbial logs, with no real worries of that sort until our very last week. One word about the Cwm itself. Shortly above Camp 3 we met the enormous crevasse which stopped Shipton's party and gave such difficulty to the Swiss last year. Here Mike Westmacott's ladder came into action. This was a fine Duralumin affair, in five six-foot sections, any number of which could be spannered together. We needed three of them here, and though the bridge sagged somewhat it provided a safe and very pleasant crossing. Further on, in the walk up to Camp 4, there were many equally enormous crevasses requiring long detours. I remember chiefly here the heat of midday. I climbed in a cotton shirt, cotton pyjama trousers, and over them windproof trousers. Even so, I watched the sweat dripping down my ice-axe shaft. At Advance Base it was too hot to sit outside. The granite walls of Nuptse and the cliffs of Everest seemed to deflect every ray of the sun down on to the poor climber.

The next problem was the Lhotse face, which had already been reconnoitred by Charles Evans, Tom Bourdillon, Charles Wylie and Mike Ward at the very

beginning of May. There were several features about this problem. Last May the Swiss underestimated it and tried to climb the whole face in one, a rise of 4,000 feet, alongside the rib known as the Geneva Spur. In the autumn, more prudently, after an accident which killed one Sherpa, they turned to the glaciated face on the right: more broken, it allowed them to place two camps. From the top they did a long traverse to the left, over the top of the Geneva Spur and down 300 feet to the Col. This route, with some modifications, we followed. For the work of preparing the Lhotse face no oxygen could be spared, and on 10th May George Lowe, with the Sherpa Ang Nima, went up to install himself at Camp 6, at 23,000 feet, above the staging Camp 5 at 22,000 feet, below the face. They spent four days cutting steps, fixing ropes, and exploring the route on to Camp 7, another 1,000 feet higher.

On 15th May I joined George at Camp 6, an airy little tent perched above a steep ice slope on which hung three hundred feet of rope. Ang Nima went down, Edmund Hillary and three Sherpas took up a tent to the site of Camp 7, and returned. On the 16th, Camp 7 was to be established.

It would have been established that day, but for a sleeping pill. These artificial aids were used by some of us to great effect. Gregory took one every night above 20,000 feet. On the evening of the 15th the wind had risen. Booming over the South Col, it was showering pellets on to the little tent, straining and tugging the fabric. We had an uncomfortable supper, with the nasty business of climbing out to chip off snow for the pot, unfreezing fingers while one watched a great lump melt to half an inch of water, and then climbing out for more. I felt to-morrow to be an important day and took my first sleeping pill of the trip. George said, 'I think I'll have one too', and we each swallowed an innocent looking green object. The pill did not affect me and I woke at six to a cloudless and windless morning. Unfortunately George did not wake. The hours between six and nine I spent pushing and pleading: George could hear every word but felt utterly drugged and unable to move. Once he knelt up and went to sleep in that position. It was not until 10.30 that two figures emerged, heavily laden. We wound our way slowly up the slopes towards Camp 7, stopping every twenty minutes so that George could relapse upon his rucksack and go to sleep again. My anxiety increased. At 12.15 we had made only some 400 feet out of a thousand, and George suggested that food might wake him. When he actually went to sleep with a sardine in his mouth it was clear that the game was up, and after only one more halt we turned, myself acutely conscious that the binoculars below would be on us, wondering what had happened. We reached Camp at two, George relapsed on his lilo and I spent the evening making contact by wireless with the camps below.

The doctors helpfully told me that he would 'sleep it off'. Most fortunately he did, and on the 17th woke up bright as a new pin. We reached Camp 7, put up the tent, and after a rest crossed the crevasse which protects it and climbed some 500 feet above. We were now, at 24,500 feet, going very slowly and not taking more than five steps at a time before stopping with head down on the ice axe. When we returned to camp I found Michael Ward there with the Sherpas.

[Photograph by K. B. Neame

An air photograph of Everest taken from $3\frac{3}{8}$ miles away showing the path of the final journey starting at the South Col (at the bottom of the photograph)

I had to go down, for John planned to have the first loads up with me to the South Col by 21st May. You see our second problem was not only to reach the Col ourselves, but to get 500 lb. of oxygen, tents and food to about the height of Annapurna, the highest mountain yet climbed. I had therefore to go down and organize the first carry, while Mike and George, with the Sherpa Da Tenzing continued on the face. The next two days they had bitter wind and were unable to reach a point much beyond our highest of the 17th, before two of them feared frostbite and they returned.

On the 20th May, therefore, when I reached Camp 7 with eight Sherpas, there was still 1,500 feet of new ground to the Col. My men had been carrying more than they bargained for, and they were very sorry for themselves. Headaches and coughs in every tent. Aspirin was of no avail, and on the morning of the 21st I decided on our alternative plan. I took on my sirdar or chief Sherpa, Anullu by name, with oxygen, leaving the others to acclimatize and add strength in numbers to Charles Wylie's party, which was to do the carry next day. Both of us were using oxygen. It is difficult to describe the sensation that oxygen gives. When all the fiddling and clumsiness of putting the equipment on is past, I can only compare it to a metallic breath of new life that makes the world seem good again. We made our way up the remainder of the Lhotse glacier, missing our course twice and once having to jump over a nasty crevasse, from one apparently unsupported ledge to another. Then the traverse, which Anullu led in extremely quick time. We had started at 9.30 a.m., to avoid frostbite; by 3 o'clock we were looking down from the top of the Geneva Spur, on to the desolate plateau which the Swiss said had the smell of death about it. Everest

still beckoned mysteriously into the mist beyond, and in the centre of the plateau were the pitiful tattered remnants of the Swiss tents of last year, yellow rags that make the words 'conquest of Everest' seem absurd. We descended the slope and Anullu fixed to his back a fine Swiss rucksack containing felt boots, on the ground that Tenzing had said that if he was first to the Col he was to have the first spoil. Then we returned up the slope, a slope that had worried us so much that I had some benzedrine tablets in my pocket, to be used here by the Sherpas in the last resort. We had tried them lower down, with the most unexpected results. One man said that it was wonderful stuff, it had cured his cough. Another said that it made him sleep excellently. Fortunately, they never had to be used.

At the top of the Spur we halted. The effect of the oxygen on me was to give me a lively interest in the scenery, and I remember thinking that but for the scientific aids with which my body was plastered it would have been impossible for me, an aesthete having no knowledge but a great admiration of things scientific, to be up here enjoying the beauty of Nuptse's wind-torn razor ridge. On this common ground poets and scientists meet. I even pointed out its beauties to Anullu, who thought me quite mad.

At Camp 7 we received a tremendous welcome. Charles and nine Sherpas had come up, together with Hillary and Tenzing, who came to give moral support and to help make the track. So vital was it that the loads go up. We were a happy crowd, but certainly a crowd. The expedition was always a little short of utensils, but it was here that I actually found Charles eating grape-nuts off a spanner.

May 22nd was a red letter day. No less than thirteen loads were deposited by Charles on the Col, and it was a tired but very happy party which reassembled at four next day. Because of this magnificent lift, Evans and Bourdillon, the two closed-circuit experts, left Camp 4 on the evening of the 22nd. The plan for them was that they should make the attempt direct from the South Col, since the closed-circuit allowed faster movement and would obviate the unpleasant ridge camp. Having reached the south summit, 28,700 feet, they were to go on if the summit ridge looked easy. They were supported by John Hunt himself, and two Sherpas. On 24th May the party reached the Col and pitched camp in a wind, that wind which moans perpetually over the highest saddle on earth. One of the Sherpas was unwell; his main function was to lie in the tents as a weight and prevent them being blown away while they were pitched. On the 25th this wind continued and the party lay low. But on the 26th the weather was good enough for an attempt. Hunt and Da Namgyal, the fit Sherpa, went ahead first, as Evans was having trouble with a broken valve on his set. This more delicate apparatus had more that could go wrong with it. However, rather later, Evans and Bourdillon were able to start: steaming ahead at a very good speed for that height, almost 1,000 feet an hour, they passed the other two and went on up the ridge. On reaching this ridge, Hunt found the little tent used by Tenzing and the Swiss guide Raymond Lambert last year, at 27,200 feet. He and Da Namgyal halted here, trying to clear the ice

which tended to block the outlet valve of the open-circuit set. Then they pushed on another 150 feet and left loads of over 40 lb. for the Ridge Camp to be set by Hillary and Tenzing, the second summit pair. They turned back, very tired.

Meanwhile the first summit pair were making good time up the ridge to the south summit. I have still a piece of paper, signed by John Hunt, which reads: '1 p.m. Tom and Charles seen at South Summit going strong for top. Great excitement here'. 'Here', of course, is the South Col, seen from which the South Summit masks the summit. In fact, Evans and Bourdillon had shot their bolt. They had performed an amazing feat climbing such a height in one day. They stood higher than man had ever stood before. But the hour was late, and they might not have enough oxygen both to reach the summit and to return. Moreover, seen from here in a mist that half veiled it, the summit ridge looked very formidable. They retired prudently and reached the Col very tired. I was able to judge next day how tired they were, and what an effort it had been, when I met them with Mike Ward at Camp 7. Unlike the open-circuit, which left us an exhilaration lasting on through the night, the closed-circuit leaves a sense of exhaustion.

On the 26th the second summit party had reached the South Col also. Hillary and Tenzing were accompanied by Lowe, who brought up Sherpas with extra loads for the Col, Gregory and three picked Sherpas for the highest carry. On the 27th this party also was compelled by the wind to lie low, and on the 28th, our friend Ang Nima was the only fit Sherpa. The party set out, carrying loads for the final ridge Camp, up the broad snow couloir which leads to the south-east ridge of Everest. They halted at the ruin of last year's tent, and Tenzing must have had curious memories of that night when he and Lambert, without sleeping bags and without cookers, had huddled for warmth and spent their time trying to melt snow over a candle for something to drink. At the point where John Hunt had dumped his loads this second party had to increase theirs. They were carrying 40, 50, and in Hillary's case, over 60 lb. They went on, first over rock and finally snow. They were determined to find a camp site higher than a camp had ever been placed before, at 27,900 feet. As time went on they became a little desperate. Every ledge looked level from below, and 45 degrees when one came to it. At last, after 2 o'clock, they found one of only some 40 degrees, and the supporting party dumped its loads with a sigh and returned. Hillary and Tenzing dug themselves in, a two-hour job, though even then the tent was at an angle. Hillary sat against the slope trying not to roll on to Tenzing; Tenzing lay below, trying not to be rolled on by Hillary.

They had four hours' sleep on oxygen that night, using the special device whereby a cylinder is connected by tubes to face masks and a low flow rate of one litre a minute ensures sleep. In the daytime we used two to four litres as a general rule. They spent the rest of the night, from what we gathered next day, making lemonade. Griff Pugh drummed into us that because of the ventilation rate at high altitudes we must drink a lot, six pints a day if possible. This was one way of absorbing our 14 ounces of sugar. Fortunately, Hillary and most of us liked lemonade, with which they ate sardines and biscuits.

[By permission of the Himalayan Committee of the R.G.S. and the Alpine Club of Great Britain

View looking north from the summit

At 6.30 of the 29th they set off. The snow slope below the South Summit was in an unpleasant and dangerous condition, but they went on in the knowledge that others had done it before. At 9 o'clock they reached the South Summit. The day was comparatively fine and windless, but even so the summit ridge was narrow in the extreme. Great cornices bent over to the right and would very soon, if trodden on, bear you down to the Kangshung glacier, 12,000 feet below. On the left was the 7,000-foot precipice above the Cwm. Fortunately snow was hard and good, and they were able to chip along in between. At one point Hillary noticed Tenzing in difficulty, and released him from the ice which had frozen up on the outlet valve. Thereafter they kept a close watch. Some way along they encountered the rock step, which we had studied through glasses. It was a 40-foot obstacle, which would have been impossible but that the snow on the right had melted away, forming a gap up which it was possible to wriggle. After that they felt that nothing could stop them, but the bumps seemed to succeed interminably, one after the other. It was 11.30 before one bump revealed nothing beyond, and they stood on the summit of Everest.

Hillary took off his oxygen mask and felt no ill effects. Tenzing buried a Buddhist offering of food in the snow and identified places in Tibet, while his more prosaic companion took photographs down the ridges. After a quarter of an hour they returned, for Hillary had been doing mental arithmetic about their oxygen supply, and was preoccupied with an anxiety as to whether they could reach two cylinders left by the others below the South Summit.

At 12.50 I was coming up the last slope to the Geneva Spur. There was a shout from behind: I looked up to see two small figures descending, for all the world like a party coming off Snowdon at Easter. This time, owing to an oversight, I was without oxygen. No more could I admire the view; three steps, and I was gasping over my ice axe. Besides this, I was carrying over 40 lb., and my Sherpa, Pasang Phutar, 60 lb., for we had had to send down two others. But the pleasure of seeing those two descending spurred us on. When we reached the Col, George Lowe was preparing to go up and meet them. He had prepared soup, I followed with a thermos of tea. We met them on the slopes under the south-east ridge, looking remarkably fresh, as I thought, but not talking much as the oxygen had by now given out. They descended, not with the elastic step of before, but steadily. Tenzing and Pasang retired to a tiny tent, while we three crowded into a two-man Meade, since the wind had blown a hole in the big pyramid.

I remembered a promise to John Hunt. This was to lay two sleeping bags in the form of a T on the slope of the Spur, if they had succeeded. If they had not, my job was to rescue or reinforce. Poor Pasang I dragged wearily up the slopes, and as there was a wind, we had to lie on the sleeping bags watching a nasty little cloud playing between us and the camp 5,000 feet below. After ten minutes I gave up, but I am told that there is still a legend in Nepal of the mad Englishman who wanted to sleep out in the snow above the South Col.

We had the happiest of discussions that night. We felt that we were part of a great company of climbers who had accomplished this ascent. We felt too, that we had in no way 'conquered' the mountain. We had conquered nothing

except unruly bits of ourselves. By the artificial means of oxygen, the trustiness of the equipment and the kindness of the weather after the afternoon snow falls of early May, we had been allowed to tread a narrow path to a summit, in one month of that year among all the years of time. All these factors we had to thank, and Everest itself for being no enemy, but a friend which had allowed us to do so much.

Next day we descended to Advance Base, where the news was now for the first time known. But we had still the return through the icefall, which the Swiss compared to a Sword of Damocles hanging over them while they were in the Cwm. Thanks to Mike Westmacott, who had lengthened bridges, cut new steps, and in many places altered the route completely, the whole party descended safely, and on 1st June was reassembled at Base Camp, in time to hear parts of the Coronation Service. On the evening of the 2nd, we were delighted to hear the cultured voice of the B.B.C. announcing that Mount Everest had been climbed by a British party. Until then, we had hardly dared to believe it ourselves.

THE CHAIRMAN: The lecturer has captivated us with the artistry, wit and humour of his lecture. We have enjoyed also the courage, and particularly the fact that he minimized the hardships and put before us the humorous and joyous aspects of the achievement. It was indeed an extraordinary feat of endurance.

There is one thing more I want to say before I propose a vote of thanks: I admire the spirit in which born mountaineers like Mr. Noyce approach the subject of climbing. If any of you want to see that spirit vividly presented, I do commend to you Mr. Noyce's book *Mountains and Men*. It is a very charming and effective book. A schoolboy once remarked that there are things so big that you cannot see them. That, I think, must be the aspect of mountain climbing which appeals most to mountaineers. The team experienced Everest in all its grandeur, but there were also a great many invisible things which, perhaps, struck them more than anything they actually saw.

A vote of thanks to the Lecturer was carried with acclamation.

SIR SELWYN SELWYN-CLARKE, K.B.E., C.M.G. (Chairman, Commonwealth Committee): I want to ask you to join with me in expressing our appreciation to Sir Harry Lindsay for coming up from the country to preside over this very enthralling and beautifully illustrated lecture by Mr. Wilfrid Noyce. The Commonwealth Section of this Society —and I think I should be safe in adding the East India Association, many of whose members we are most happy to see with us this afternoon—felt that none would grace the chair more fittingly than Sir Harry. There were three reasons for this: first of all, Sir Harry's long and distinguished service in India, some of it, as he told us, within sight of the Himalaya; secondly, Sir Harry is the Past President of the Royal Geographical Society which, as you know, was one of the chief sponsors of the Everest Expedition, and he is also a Past Chairman, a very able and hard-working Chairman, of the Dominions' and Colonies' Committee, now the Commonwealth Committee of this Society. The third reason was the wish to pay tribute to the remarkable contribution which Sir Harry made as Director of the Imperial Institute, from which position he retired, to the great regret of many of his friends, at the beginning of this year. For eighteen years Sir Harry devoted a tremendous amount of time and trouble in binding together the various units of the Commonwealth, and he also made a very remarkable contribution to education on Colonial Affairs.

The vote of thanks was carried with acclamation, and the meeting then ended.

THE WORK OF THE WRIGHT BROTHERS FOR AVIATION

A paper by

J. LAURENCE PRITCHARD, C.B.E., Hon.F.R.Ae.S.,

late Secretary, Royal Aeronautical Society, read to the Society on Wednesday, 16th December, 1953, with the Right Honble. Lord Sempill, A.F.C., Past President, Royal Aeronautical Society, in the Chair

THE CHAIRMAN: To-morrow at Kitty Hawk many fortunate ones, from all over the world, will be meeting in tribute to the Wright brothers, whose first flight was witnessed by a mere handful fifty years back. It is particularly appropriate that the official British representatives will in a few hours be flying there in a Canberra. The Canberra, leader in its jet propelled class, is a product of the inventive and design genius of two Fellows of the Royal Aeronautical Society. We are met to hear a paper on the work of the Wright brothers from an Honorary Fellow, until but recently, and for several decades, Secretary of that Society.

Captain Pritchard is an old friend with whom I have worked in the field of aeronautics from the early days. As I have said, this address is no ordinary lecture, but a tribute, by one who has been in aviation from the early days to the Wright brothers, the importance of whose contribution to our scientific and technological world cannot be overstressed.

Sir George Cayley, a Yorkshireman born in 1775, is better known as 'the Father of Aeronautics'. He always pictured the aeroplane as an invention that would be very beneficial to civilization. He constructed gliders, and was only prevented from building a power-driven machine by lack of the power unit. He spoke of the air as a vast navigable ocean that stretches out to the threshold of every man's door, and should be used for human benefit and advancement. These were his views expressed before the middle of the nineteenth century, which were re-echoed by the Wright brothers in the early years of the twentieth century. Orville Wright was most emphatic on this and more than once told me that he and his brother would not have set their hand to the development of power flying had they visualized the wrongful use to which it was often put. The speaker, who also knew the Wright brothers, will be very conscious of this.

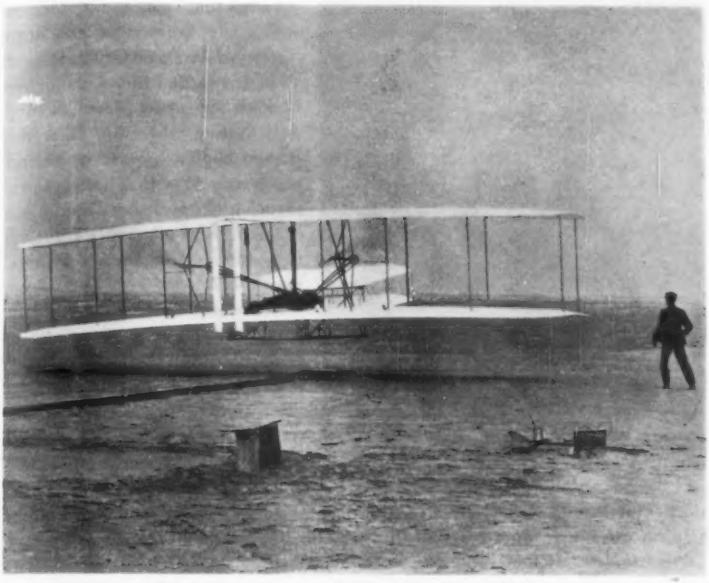
I now have very much pleasure in asking Captain Pritchard to deliver his paper, and I need not remind you that no one is better qualified to tell with authority of the work of these unique brothers.

The following paper, which was illustrated with lantern slides, was then read:

THE PAPER

This is a unique occasion and one which calls for a special tribute to the Royal Society of Arts.

I quote from page eight of the first Annual Report of the Aeronautical Society of Great Britain. 'The first meeting of this Society was held at the great hall



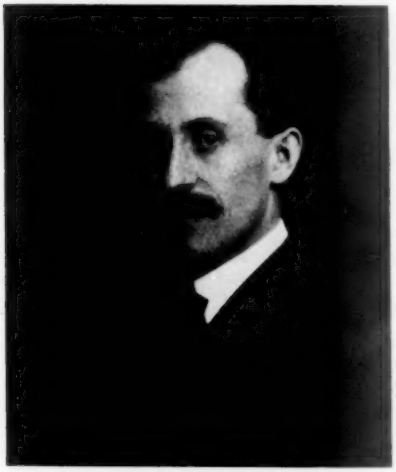
The start of the first heavier-than-air controlled flight, 17th December, 1903. Orville Wright is the pilot: Wilbur Wright is running beside the plane

of the Society of Arts, on the 27th day of June, 1866. His Grace the Duke of Argyll in the Chair'.

Ever since that day, until 1935 when larger audiences compelled a regretful change, meetings of the Aeronautical Society were held at the Society of Arts. It was so poor, its membership so small, that the Society of Arts often provided a room free of charge in those early days, so that those whom the law sometimes threatened to lock up as lunatics, could talk about the mad days of the future when people would fly.

I have served the Council of the Society, either as a member of it, or as its secretary, more years than any one in its long history, and I spent many of those years listening to lectures on aeronautics in the Royal Society of Arts. I speak, therefore, with knowledge as well as gratitude of the ready help and kindness shown by the Society of Arts in 1866 and afterwards, to a body like ours, so unlikely to survive to see its dream become a reality. On 12th January next, the baby nourished by the Society of Arts will have its 88th birthday.

In the lecture theatre of the Society of Arts have spoken the great figures of aeronautical history—Wenham, Stringfellow, Glaisher, Phillips, Maxim, Hargrave, Pilcher, and so many others. The Aeronautical Society appreciated



Orville Wright

greatly the outstanding tribute which the Council of the Royal Society of Arts paid Orville Wright, when it awarded him your highest honour, the Albert Medal, in 1917. It is fitting, therefore, that this Society should have in its records some account of that final achievement which has changed the outlook of mankind so materially in the last fifty years and has raised great moral issues which are still unresolved.

On 30th May, 1899, Wilbur Wright, a cycle manufacturer of Dayton, Ohio, in partnership with his brother Orville, wrote to the Smithsonian Institution, the National Museum of the United States, 'I believe that simple flight is possible to man. . . . I wish to avail myself of all that is already known and then if possible add my mite to help on the future worker who will attain final success'.

His brother Orville wrote, afterwards, 'On reading the different works on the subject we were much impressed with the great number of people who had given thought to it. Among these . . . I may mention Leonardo da Vinci, one of the greatest artists and engineers of all time; Sir George Cayley, who was among the first of the inventors of the internal combustion engine; Sir Hiram Maxim, inventor of the Maxim rapid fire gun; Parsons, inventor of the steam turbine; Alexander Graham Bell, inventor of the telephone; Horatio Phillips, a well-known English engineer; Otto Lilienthal, the inventor of instruments used in navigation and a well-known engineer; Thomas A. Edison; and Dr. S. P. Langley, Secretary and head of the Smithsonian Institution'.

Such a formidable list of failure (and it could be very greatly extended) to solve a problem which had actively intrigued mankind for over a century, was discouraging. Wilbur at that time was 32 and Orville 28 years of age. They were young enough not to be deterred by great failures and confident enough not to be overawed by the immensity of the task. They were men apart.

The brothers, in their reading, paid particular attention to Octave Chanute's book, *Progress in Flying Machines*. A Past-President of the American Society of Civil Engineers, he had made many gliding experiments. Wilbur wrote to him asking for advice and help. Chanute responded generously of his knowledge, and by his constant encouragement over the next few years did much to help toward their success. It is interesting to recall that in his reply to Wilbur's letter he referred to many papers of the Aeronautical Society which might prove useful.

Wilbur Wright

In the year 1900 there was no flying experience upon which the brothers could draw. There were tables of pressures on flat plates and on various kinds of curved wings in winds of various speeds, but none reliable. There had been some kite flying and some gliding. Two of the most experienced and best known gliders, Lilienthal in Germany, Pilcher in England, had been killed a few years before, and many others had suffered disaster.

The two brothers soon became convinced that all previous experimenters had failed to find the vital secret of control. 'The problem of equilibrium,' said Wilbur Wright, 'had been the real stumbling block in all serious attempts to solve the problem of human flight, and this problem of equilibrium in reality constituted the problem of flight itself'.

Just before the brothers began their first gliding experiments, Wilbur wrote to his father, 'My idea is merely to experiment and practice with a view to solving the problem of equilibrium. . . . In my experiments I do not expect to rise many feet from the ground. . . . I do not intend to take dangerous chances. . . . I am constructing my machine to sustain about five times my weight and am testing every piece. I think there is no possible chance of its breaking while in the air. . . . I have not taken up the problem with the expectation of financial profit. Neither do I have any strong expectation of achieving the solution at the present time or possibly any time. My trip would be of no great disappointment if I accomplish practically nothing'.

When Wilbur died in 1912, his father, Bishop Wright, wrote in his diary that day, 'This morning Wilbur passed away. A short life, full of consequences. An unfailing intellect, imperturbable temper, great self-reliance and as great modesty, seeing the right clearly, pursuing it steadily, he lived and died'.

I have quoted Wilbur's letter and his father's diary, for both bring out so clearly the character of the man, a character fully shared by his brother Orville. They were inseparable in outlook and action.

Their first glider weighed 52 lb. and was a biplane with a total surface of 165 sq. feet, with a span of some 18 feet. The brothers chose to begin their great adventure on the sea coast at Kitty Hawk, North Carolina, on a lonely flat stretch of sands where they were not likely to be disturbed and where they could get the winds they wanted for experimenting.

The first major step towards the solution of the problem had been found

before the glider was constructed, while the brothers were watching some pigeons flying. One bird in particular, kept oscillating from side to side, 'that is', said Wilbur Wright, 'it tilted so that one wing was elevated above its normal position and the other depressed and then tilted in the opposite direction'. Many observers must have noticed the way birds fly, but none had been able to interpret and apply what they had seen. The brothers argued that the birds moved their wing tips so that one wing could be made to lift more than the other, enabling the bird to right itself if it began to turn over. 'In speculating on possible methods of constructing a flying machine to carry a man, we hit on the idea of providing a structure consisting of superposed surfaces rigidly trussed along their front and rear margins', said Wilbur Wright, 'but not trussed from front to rear'.

This solution may seem now surprisingly simple, but it was a fundamental discovery in control. The Wrights by their construction could warp each wing tip to give lateral control, as well as move the whole upper wing forward to give fore and aft control. That step alone put the two men in a class by themselves and enabled them to solve, in such a short time, the problem which leading scientists and engineers of the world had for centuries failed to do.

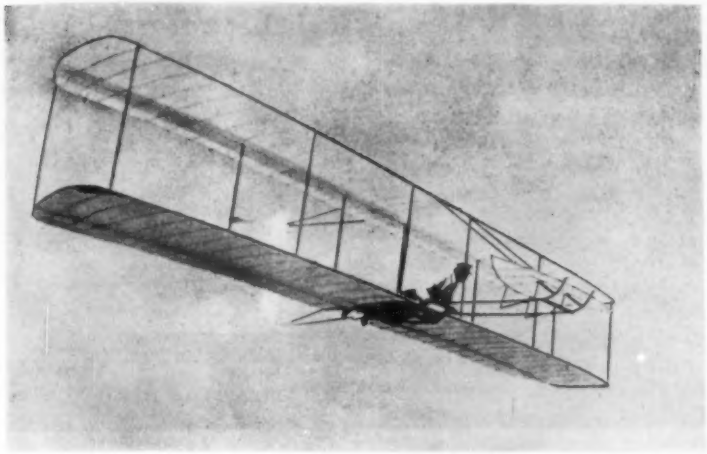
From practical considerations the brothers found that a fore and aft control could be better obtained by using a small movable horizontal surface in front of the main planes. This, with the warping of the wing tips, provided all the necessary control that was wanted. No tail surface, either vertical or horizontal, was provided in this first glider.

The glider was first of all flown as a kite, with one of the brothers lying prone on the centre of the lower wing, to lessen the head resistance. In this way the lift and drag of the glider could be measured in winds of known value. Although the controls were not always as fully effective as they had hoped, the Wrights were satisfied they were on the correct lines. It was during these tests that the brothers began to suspect that many of the published data of Lilienthal and others were not correct. The total time spent in free gliding that first year was only two minutes, all on the last day of the visit to Kitty Hawk!

Short though their experience had been the brothers were confident enough to build a much larger glider in 1901, with an area of 290 sq. feet. The new glider, after certain adjustments, confirmed the inaccuracy of most published figures. In fact, the lift appeared to be only about one-third of what Lilienthal had predicted.

In one of the most famous aeronautical lectures ever delivered, Wilbur Wright, in September, 1901, told the Western Society of Engineers in America of the full-scale measurements he and Orville had carried out at Kitty Hawk, the first of such measurements ever made, and that as a result he and his brother were then beginning to carry out further experiments to determine accurately 'the amount and direction of the pressure produced on curved surfaces when acted upon by winds at various angles'.

In a small wind tunnel, only sixteen inches square, the Wrights tested more than 200 aerofoils at varying angles to the air stream. Many hundreds of readings



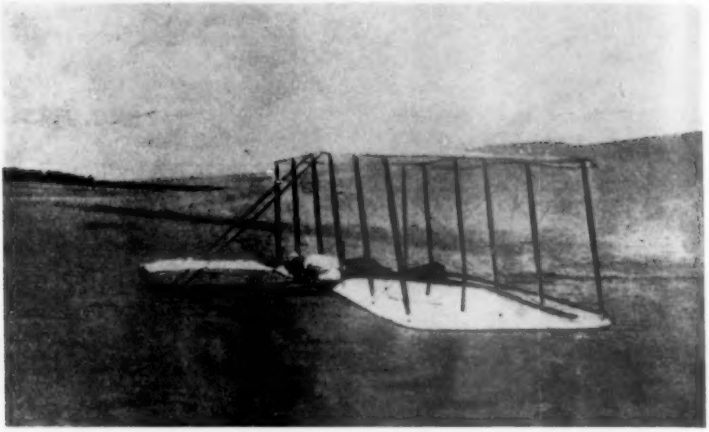
Wilbur Wright making a high glide, 1902

were taken in only two months. Those two months of aerodynamic research place the Wrights among the great research workers of the world. The work they did then is an inspiring example of the simple research methods of genius. 'This was indeed a surprising research programme for the year 1901', said Dr. Lewis, Chairman of the National Advisory Committee for Aeronautics in his 1939 Wilbur Wright Memorial Lecture. 'So clear was the Wright Brothers' appreciation of the basic factors in the problem that they included all but one of the important variables that have since concerned us in wing and aerofoil research. Since it was never published,* the research programme bears the independent approval of eminent scientists in this field, who have almost universally employed the same method of attack. . . . The question of translating the recorded measurements into forces effective on a full-scale machine is the crux of the whole situation, and in this respect the Wright brothers revealed not only considerable understanding of mechanics, but an astonishing appreciation of the pitfalls involved in a small-scale wind tunnel'.

The confidence of the Wrights in their own research results was great enough to encourage them to build a still larger glider in 1902, with a wing area of 305 sq. feet, a front elevator of 15 sq. feet and two fixed vertical rudders of 11 sq. feet.

The fixed rudders nearly led to a bad stalling disaster while Orville was gliding. Although he escaped injury, the machine was damaged and the vertical surfaces were replaced by a single movable surface which was interconnected with the

* The data and particulars of the research were not fully published until December, 1953, though Lewis was made aware of the programme through Orville Wright.



Orville Wright landing in an early glider

warping mechanism of the wings. Over 700 glides were made in the next two or three weeks, some of them in winds up to 30 miles an hour, with the glider under full control. No glides had ever before been made in such winds, nor had any previous experimenters been able to use a glider of such large surface.

The brothers left Kitty Hawk at the end of October, 1902, with the knowledge that they had spent more time in the air in a controllable glider than any other experimenters before them. They had also obtained sufficient full-scale data to confirm their model results and to justify the construction of a power-driven aeroplane.

Hugh Dryden, responsible for all aeronautical research in the United States, in his Wilbur Wright Memorial Lecture for 1949, declared, 'Wilbur and Orville Wright achieved success as a result of keen intellectual effort and hard work, and not by some chance inspiration. They devised new instruments of research; they conducted extensive experimental programmes in wind tunnel and flight; they studied problems of aerodynamics, thermodynamics and structural design; they applied the results to the design of a practical aeroplane; and they had the immense satisfaction of successful flight'.

In the twelve months, December, 1902–December, 1903, much of it in the time they could spare from their cycle business, the brothers designed, constructed and tested their own engine upon which their lives would depend; designed and made their own propellers, when none had been designed before them; designed and constructed the aeroplane itself, and predicted what its performance would be; and finally flew it according to schedule. Nor should it ever be forgotten that these two men, with only a general education, taught themselves the mathematics and mechanics necessary to do what they did.

Many attempts in the last fifty years have been made to decry the real achievement of the Wrights, but every year it becomes clearer how great they were. All their papers, following the death of Orville Wright in 1948, were deposited in the Library of Congress, and are now gradually becoming available.

The astonishing thing about these two men is that within six weeks they had designed and built and were testing a four-cylinder engine, with only the help of the mechanic they employed in their cycle shop at Dayton. Wilbur wrote a letter to Chanute voicing his distrust of motor manufacturers' claims, pointing out that if they built their own engine they could at any rate rely upon its weight and horse-power being correct. The engine finally developed 12 h.p. and weighed only 170 lb., a considerable advance on their hopes. The design and construction of the aeroplane itself followed the general lines of their successful 1902 glider. The total area was 510 sq. feet, and the weight between 750 and 800 lb.

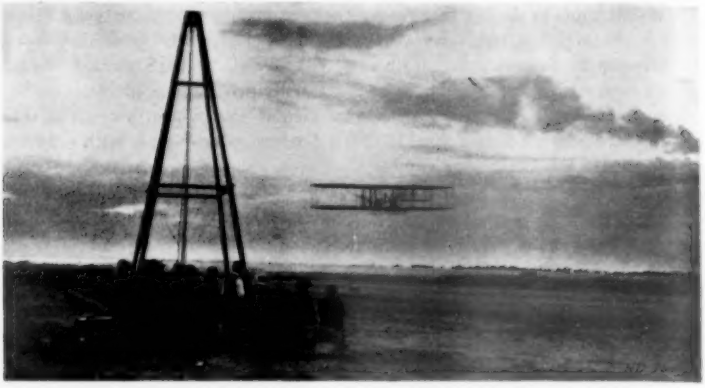
The brothers arrived at Kitty Hawk at the end of September, 1903, but storms delayed their work. In between erecting the aeroplane and testing the engine and propellers, and the storms, the two practised gliding so that they would have their 'eye in' for their first flights. Automatic methods for measuring the time and distance of the flights and the total revolutions of the propellers during a flight, were designed, so that they would have a careful record of what happened. The thought of possible failure was not in their minds as their diaries and letters of the time clearly indicate.

On 14th December, 1903, the first attempt at a flight was made with Wilbur as pilot. As the machine left the track on which it ran for the start over the soft sand, he turned the nose up too sharply, lost speed and landed heavily, breaking some of the supports of the front elevator. That evening he wrote to his father, 'The machinery all worked in an entirely satisfactory manner and seems reliable. The power is ample, and but for a trifling error due to lack of experience with this machine and the method of starting, the machine would undoubtedly have flown beautifully. There is now no question of final success'.

On 7th December, 1903, a bitter north wind, of between 20 and 25 miles an hour, blew across the dreary, deserted waste of sand. The rain-filled pools in the sand were covered with ice. As the wind showed little signs of abating, it was decided to attempt a flight, and an agreed signal was made to announce the fact to the Kill Devil Life Saving Station, just over a mile away. 'After running the engine and propellers a few minutes to get them in working order', wrote Orville in his diary that day, 'I got on the machine at 10.35 for the first trial'.

Five people stood on the bleak sands to watch the beginning of a new era in history, J. T. Daniels, W. S. Dough, and A. D. Etheridge, from the Life Saving Station: W. C. Brinkley, from near by Manteo: and the inevitable boy, Johnny Moore.

With Wilbur at one tip to keep the machine on a level keel as it ran down the track, and Orville lying prone on the lower wing at the controls, the machine rose slowly, erratically, flew for twelve seconds and landed about 100 feet from the end of the track. An hour later Wilbur made the second flight of eleven



Wilbur Wright flying in France, September, 1908. The launching derrick is in the foreground

seconds and covered a distance of 175 feet. The third flight by Orville covered practically the same distance in fifteen seconds and at midday Wilbur made the fourth and final flight, which lasted 59 seconds and covered a measured distance of 852 feet.

As the brothers were discussing this last flight all possibilities of any further flights that year were ruined as a sudden gust of wind struck the machine, turning it over to damage it beyond immediate repair.

That afternoon Orville Wright telegraphed to his father in Dayton, 'Success four flights Thursday morning all against twenty-one-mile wind started from level with engine power alone average speed through the air thirty-one miles longest 59 seconds inform press home Christmas'. The telegraph operator told a local news reporter who wrote a garbled and untrue account of what had happened. Only three American papers troubled to print anything the following morning, and the *Dayton Journal* refused to print anything on the score that any flight under a minute was not news! The greatest news in the world passed the world by, at the time.

More interest, indeed, was shown in Great Britain and France than in America. The *Journal of the Aeronautical Society* had published in April, 1901, the first paper ever written by Wilbur Wright, and leading members of the Society had kept in regular correspondence with the brothers and Chanute. In April, 1904, the *Journal* published an accurate account of these first flights, sent to the President, Major Baden Powell, by Orville Wright himself.

That year a new machine with a new engine was designed and built by the brothers, and trials were carried out in a large field some few miles from Dayton, so that they could be near their own workshop. The editors of a number of newspapers were informed of the flying trials which were going to be made.

As fortune would have it, on the first two days' flying was not possible, largely due to the difficult nature of the ground itself, and the reporters lost all further interest.

To overcome the difficulty of starting, the Wrights made a derrick with a falling weight attached by a rope to the aeroplane. As the weight fell, the machine was accelerated along a short track, to give it flying speed. That year over a hundred short flights were made, including two circular flights of five minutes each, to study any further difficulties of control. Although the field where the practice flying was being made was bounded by a well-used road and a railway line, the flights attracted little attention. They were still not news!

In 1905, with a modified machine, flights of over half an hour were made and distances up to 24 miles flown in circuits of the field. On 17th November of that year Orville Wright wrote to Patrick Alexander, a member of the Aeronautical Society, 'We have finished our experiments for this year, after a season of gratifying success', he began, and after giving details of the year's flights, finished, 'The machine passed through all these flights without the slightest damage. In each of these we returned frequently to the starting point, passing high above the heads of the spectators. If you think the contents of this letter would be of interest to members of the Aeronautical Society of Great Britain, you are at liberty to communicate as much of it as you please to them'.

This letter was printed in the Society's *Journal* in full. The news spread, so that even the world's press could no longer overlook such world news, only to find that for the next two years the Wrights had given up flying! Their flights had attracted the attention of governments and the usual secret and interminable negotiations began.

The world had almost forgotten the Wrights when, in 1908, Orville in America and Wilbur in France, began flying again, Orville to satisfy the United States War Department they really had an aeroplane, and Wilbur to satisfy a French syndicate that he could fly.

On 10th August, 1908, Wilbur Wright made two short flights at Le Mans, one a complete circle and the other a figure of eight. 'The newspapers and the French aviators nearly went wild with excitement', he wrote to his brother. 'Bleriot and Delagrange were so excited they could hardly speak, and Kapferer could only gasp and could not speak at all. . . . You never saw anything like the complete reversal of position that took place after two or three little flights of less than two minutes each'.

Orville Wright in Washington caused just as much excitement. Lt.-Col. C. O. Squier, who had been working with the Wrights on behalf of the United States War Department, said at the first Wilbur Wright Memorial Lecture in 1913: 'The Wright Brothers came to the War Department and informed us of what they could do, and they so convinced the authorities that money was found to give them this first contract. The contract promised to pay £5,000 for any heavier-than-air machine capable of carrying two people weighing in the aggregate 350 lb. with petrol sufficient for 125 miles at a speed of 36 miles an

hour. The issue of the contract was criticized severely, and the War Department was supposed to have lost its head.

'In due course the American machine was delivered to the Government. People heard many rumours about it, but never having seen any one fly, did not believe in it. On 19th September, 1908, Orville Wright went out early in the morning and flew for 58 minutes: only a few soldiers observed him. The effect was marvellous: it disorganized Washington completely. That afternoon he flew again at half-past four, in the presence of every single man, woman and child who could get to the aerodrome'. Not only Washington, but London, Paris, Berlin and other world capitals were disorganized, for there were too many shrewd politicians who were well aware of the portent in the skies.

That year, 1908, was a year of unbelievable excitement, enthusiasm and interest in flying, a year which only comes when the world is suddenly confronted with something entirely outside its previous experience. Leading (and non-leading) members of the public, the Aeronautical Society and the Aero Club poured over from London to Le Mans to see the new miracle. Kings and politicians, people famous in the world of science, business, sport and art, watched the most unbelievable thing happen before their own eyes.

Before the year was out, leading aviation enthusiasts from Great Britain and France had been given their first flight, Griffith Brewer being the first Englishman and Ernest Zens the first Frenchman. Wilbur made over a hundred flights, six of over an hour each and one, on the last day of the year, of 2 hours 20 minutes. In America, Orville had made a number of flights of over an hour.

Early in 1909, Wilbur and Orville Wright, and their sister Katharine, visited England on the occasion of the award to the brothers of the Gold Medal of the Aeronautical Society. Their flying demonstrations in France were finished and the brothers devoted less and less time to flying, except for testing new machines. In 1911 both paid visits to Europe, chiefly on account of business affairs which both strongly disliked but could not avoid.

In May, 1912, came the tragedy of Wilbur Wright's death from pneumonia, at the early age of forty-five. His constitution had been weakened by the worries of constant litigation and business. Three years later Orville Wright sold all his business interests, so that he could carry out that aeronautical research he felt inclined to do, free from all business considerations.

But trouble loomed ahead. When Wilbur Wright had written to the Smithsonian for information, he had been sent, among other papers, one entitled 'Experiments in Aerodynamics', by S. P. Langley, secretary of the Smithsonian. Dr. Langley had made a successful flying model in 1896, and in 1903 he had built a full-sized aeroplane fitted with a motor. Twice that year the structure of the aeroplane collapsed at the moment of launching, the second time on 8th December, 1903, only nine days before the Wrights' success.

Langley died in 1906, convinced that the failure of his machine was due to the launching apparatus. He had carried out no further experiments as the Government refused to finance any more trials. Langley was succeeded as secretary by Dr. Walcott, who had not long been in office before he began to

belittle the efforts of the Wrights. In 1910 he wrote to Wilbur Wright saying that the National Museum was endeavouring to enlarge its aviation section, and suggested the brothers might like to let the museum have one of their machines. When offered the first machine to fly, Walcott suggested that the machine which flew in 1908 for the United States War Department would be more suitable.

The Wrights did not reply to that letter. In 1914 Griffith Brewer, who had become a very close friend of Orville Wright, paid a visit to the Smithsonian and was astonished to find that Langley's full-sized machine, which had been on exhibition for some years, was missing. He was told it was being tested at Hammondsport by Glenn Curtiss. Brewer visited Hammondsport himself and found that Langley's machine had been structurally altered as well as aerodynamically, and had been provided with an altered engine. In the annual report of the Smithsonian that year, it was stated that the Langley machine had been flown *without modification*, and in the following year, 'The tests thus far made have shown that former Secretary Langley had succeeded in building the first aeroplane capable of sustained free flight with a man'.

Griffith Brewer, a member of the Council of the Aeronautical Society and in after years President, was not, because of the 1914–18 war, able to do anything until October, 1921, when he read his now famous paper to the Society, 'The Langley Machine and the Hammondsport Trials'. In that lecture he bluntly accused the Smithsonian Institution and its officials of having faked Langley's machine so that the claim could be made that Langley anticipated the Wrights. All the evidence was clear that the Langley machine was never capable of flying and its wings were far too weak to carry the loads imposed on them.

To accuse a National Museum of faking an important exhibit, is not lightly done. The evidence Brewer brought forward convinced most people, except the Smithsonian officials, who boldly labelled the Langley machine as being the first one capable of flight, carrying a man.

The story is a sordid one in many ways. Following a suggestion of Griffith Brewer, the 1903 machine was sent to England by Orville Wright and there shown in the Science Museum in 1928, following the opening of the Museum by King George V. And there the machine remained for twenty years, for Orville Wright publicly stated that as long as the Smithsonian persisted in their claim and refused to withdraw the untruthful statements made year after year, he would not allow the most famous aeroplane in the world to return to America.

Dr. Walcott died in 1927 and his successor Dr. Abbot, although agreeing alterations had been made in the Langley aeroplane, refused to withdraw the claim that it was capable of flight. Pressure of public opinion finally forced Dr. Abbot in 1942 to acknowledge everything Brewer had stated in his lecture and to state publicly his regret on behalf of the Institution that statements had been made that Langley had succeeded in building the first aeroplane capable of sustained free flight by man.

It was not until 1948, on 17th December, that the famous aeroplane was first exhibited in the Smithsonian, too late for Orville Wright to take part in the

opening function or for Griffith Brewer, who had done so much to ensure its return, for both had died within a few weeks of one another, at the beginning of the year. Of the five people who saw the first flight, only one lived to be present that day in the Smithsonian: Johnny Moore, the boy who had come across the sands near Kitty Hawk to watch, on 17th December, 1903.

Every aeroplane which is flying to-day owes to Wilbur and Orville Wright the fundamental discovery of its method of control. The warping of the wing tips in 1900 and the forward horizontal plane have been replaced by the aileron and the elevator or other mechanical aerodynamic equivalents, as experience has grown.

These were men whose like may not be seen again for many years.

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DISCUSSION

THE CHAIRMAN: The very loud applause is clear evidence of the masterly way in which Captain Pritchard has dealt with the subject. It is more than fitting that we should be met one day in advance of the 50th anniversary of the first power-driven flight at the bidding of the Royal Society of Arts, which for two centuries has led in encouraging the development of the arts, whether scientific or technological. We are all glad to see gathered in this lecture theatre several who worked with the Wright brothers.

This, you will agree, is no occasion for a technical discussion, but for a continuation of the tributes, from pioneers in the audience. I now call on Colonel Alec Ogilvie, who has spent his entire life in the front line of the development of flying. As soon as Alec Ogilvie heard something of the pioneering of the Wright brothers, he went straight to Kitty Hawk and became, in fact, their first British pupil.

COLONEL ALEXANDER OGILVIE, C.B.E.: The whole subject is altogether too big for me to say very much without any preparation. I should like, however, to make just this one point about the Wrights. Nowadays it is easy enough to fly. Wilbur used to say, 'Any old shingle will fly if you give it enough power'; but in those days, before there had been any flying, you had to have a great many things right before you could get away with it. You not only had to get the aeroplane right and the control right, but you had to get your engine within a reasonably limited weight and you had to get propellers to drive the machine, which also had to be right. It is not as if you could go out in a boat and gradually improve it; you have to be right in the beginning and that is what the Wrights did in their first flight. Their machine was good enough, their propellers were good enough, their engine was good enough, and they themselves were good enough; all those four factors had to be combined and no one had done this before. I think a lot of people thought for a very long time after 1903 that there was not so much to it and that it only needed a little bit extra here and there, and you could fly; but the fact remains that even with the knowledge that people had been flying for four or five years, nothing was actually done. The first flight in Europe was, I think, by Santos-Dumont on a Hargrave box kite, but in 1908, after hearing that Wilbur was actually flying in Europe, we went to see what was going on in other places in France with people like Farman, Esnault Pelterie, Bleriot and others. We made a sort of tour round and we saw several flights, but the proceedings were very grim. It did not look safe and it certainly was not safe.

As soon as they tried to turn, the machine skidded round a corner; it was not really flying at all. When we went to see Wilbur himself at Champs d'Auvours, and saw him in the air, it was an absolute revelation. I was altogether overwhelmed. A dream that people had been thinking about for so long had come true. It was marvellous; the whole of Europe flocked to the scene.

As regards the two men themselves, I myself think more highly of Wilbur as an intellectual force, but there is no doubt that Orville had a remarkable mechanical gift. He seemed to know how to treat any material and get what result he wanted. Yet when it came down to sheer brains and concentration on a technical problem I always used to think Wilbur was the greater of the two. When the brothers were separated by the death of Wilbur in 1912 at the early age of 45, I do not think Orville was quite himself again. He had a terrible accident at Fort Myers and his back used to hurt him a great deal whenever he was flying, but he used to fly sometimes after this. He was a bold flier, I do not think there is any doubt about that. I saw him have quite a few accidents when we were gliding in Kitty Hawk in 1911. He was, to my certain knowledge, pitched out twice when the machine hit the ground; one of the occasions was legitimate, the other was not. I am not going to tell you exactly why this accident happened, because it was too serious a reflection on us as aeroplane mechanics. As an example of his agility, I know of a picture taken of two or three of us trying to stop the machine turning over backwards. It was up at an angle of forty-five degrees with one wing on the ground. It was turning over backwards and Orville was already out of his seat, more or less hanging on ready to land on his feet even at that stage. It was very difficult gliding and soaring from the sand-hills near Kitty Hawk. It was all right once you were going down the slope. If you imagine the wind streaming over and round a flattish cone of sand, you can see that you got a good lift as long as you were facing exactly into the eye of the wind, but as soon as you were well up and above the top of the hill, you did not know where you were relative to the top and the wind direction, and it was pretty nasty if you got into the air stream flowing round the sides of the cone. In fact, we found it necessary to put out some marker people on the hill for us to know where we were.

It was, as Orville admitted, the most difficult flying he had ever done, because he had to have a fairly high wind to get the soaring he wanted, thirty miles, or even more than that, and as the machine was designed for a normal speed of twenty, you were driving it at a fairly fine angle and the reactions were pretty violent.

When we started it was with the various controls that were thought necessary in the Dayton factory. But when we got to Kitty Hawk and tried the thing it was no good at all, despite the little notebook which Pritchard has been talking about. It was not up to the standard required on the Kitty Hawk hill by any means, but luckily there was a packing case near the sheds there. In it there were spare parts of the 1905 machine and parts of the machine of 1908. Most of the wings and elevators and so on were there and with these we very much enlarged the control of the machine. In one of the slides we have seen there was the most fantastic-looking tail thing at the back; that was sawn off one of the old machines and we rigged it up and got just about enough surface. The centre of gravity was brought so far back by the heavy tail structure that we had to use what Orville described as his secret balancing device. This was really only a bag of sand stuck out in front in order to bring the centre of gravity forward.

There is something else which you might think rather amusing. When I talked to Orville about an air speed indicator and said I thought it was badly needed, he said he did not think so; he did not really see it was much good, because before you learnt to fly you did not have time to look at it, and when you could fly you did not want to. That was very largely the attitude, I expect the chairman will remember, in the early days of the Central Flying School when air speed indicators were not very highly thought of. As a matter of fact, just to give you an example of what the

Wrights themselves went in for when they wanted an instrument: one of the things which they well understood was required was an inclinometer to give some notion of the angle at which you were hitting the air. This instrument was fairly simple. It was just a piece of string about a foot long with a knot tied about half an inch from the end, and the end fluffed out. The other end of the string was tied on in front somewhere where you could see it. As long as it was flying fore and aft you knew you were not skidding. The angle of the string fore and aft would tell you whether you were climbing or not.

THE CHAIRMAN: We are very grateful for this piece of unrecorded history. I can see that Colonel Ogilvie has forgotten nothing, since his colleague of those days, and my very good friend, Major Searight, nods his head with approval and indicates that he has nothing to add.

No-one in the world has produced more horse-power for aircraft than Sir Roy Fedden. I should like him to say a few words about the Wright engine, the first internal combustion aircraft engine.

SIR ROY FEDDEN, M.B.E.: As a boy at school I remember the wonderful news of the Wrights' flight. I remember reading and talking to my friends and my father about this tremendous step forward after such a long period of trial and so many disappointments. I think the thing that struck me very much was how this profound step forward was almost entirely neglected at the time. I had the great honour of meeting Orville Wright twice at his home outside Dayton, and also of going to see the Wright brothers' wind tunnel and all the tools and equipment they used for this development.

Undoubtedly the whole success of flying was bound up in being able to get an engine of the right proportions and the right weight. To be able to make, as the Wright brothers did, an engine of such fine power ratio so successfully in six weeks is almost unbelievable. I should very much like to have met the mechanic engineer to whom they deputed a great deal of that work, because if you look at that engine and its proportions, it really was a most remarkable effort. Many other people have tried to make prime movers for aircraft. We all know of the work of Manley and his great engine, which was an extremely fine effort in the eighteen-nineties. Those two engines stand out clearly in my mind compared with any other engines that were produced at that time.

We had no idea in the early days of the power required to go fast. When you see a modern machine to-day like the Canberra with an effective horse-power of 30,000, you realize how slow the piston engine was. In between the two wars we were struggling to make an advance of only two horse-power at a time. It is the jet, with its vast power, that has enabled these great strides to be made in speed of flight.

THE CHAIRMAN: So far, the speeches that we have had have all come from members of what one might call the 'old guard'. I am going to ask one more to speak, Eric Gordon England; and then I am going to ask one brilliant example of the men who, to-day, have taken over where the pioneers left off, a pilot and brilliant executive, Mr. Peter Masefield.

MR. E. GORDON ENGLAND: I am glad to pay a word of tribute to Captain Pritchard, who has been a tremendous force in aviation, a much greater force than he knows, and probably than we know. But it will emerge, as these things do, in the course of time for the benefit of posterity.

The younger people here will not realize the sort of atmosphere in which all this pioneer work was done. I was very young when the Wright brothers made their first flight in Europe, but it decided me that the time had come to enter 'Aviation'. I went to my poor father and said to him: 'Aviation is the coming thing. I must go into it. Please may I leave my apprenticeship as an engineer in the railway works and devote my whole time to aviation'.

He, curiously enough, agreed, on one condition, and that was that I should get a job for myself and avoid drawing on his purse. I went to the only four people then who were really doing any experimental work, and who had any staff, in this country, and I said: 'I've got a bet on with my father, will you help me win it and give me a job?' One did, and I was thereupon appointed 'aerodrome manager' and given the princely salary of 25 shillings a week.

When my maternal grandmother got to know of this, she called a family conclave. I had a long, tedious session listening to the luminaries proving that there was no future in the game. My grandmother summed up the whole thing by saying, 'If God had meant Eric to fly, he would have been fitted with wings'.

I replied, 'Granny, if God had meant you to travel on a railway He would have fitted you with little wheels'. Whereupon the old lady went purple in the face and banned me from her house for eighteen months—very rightly, because it was a very rude thing for me to have said. All who were there lived to see the thing in which they thought there was no future dominating this world. I think it is a very sad and deplorable thing that it has dominated the world in the way it has. I have always admired the foresight of the Wright brothers in seeing the evil that was contained in their particular activity if it got into the hands of the wrong people. I think the best tribute that we can pay to the Wright brothers is to put it, in future, to a positive purpose and not a negative purpose as we have done hitherto.

MR. PETER MASEFIELD (Chief Executive, British European Airways): I come from a generation once removed from that of which we have been talking; but I should like, if I may, to pay a tribute, first of all, of course, to the memory of the Wright brothers, and secondly to Captain Pritchard for the way he has spoken to us this afternoon about the great days. Those are legendary days to us who were not then born or even thought of, legendary days which, I suppose, will eventually be termed the golden years of flying, when it really was a sport, an endeavour and an enterprise. It was not, of course, commercial in any sense of the word. Perhaps we have gone backwards in taking aviation to war and to the mundane ways of commercialism. And yet, you know, when one looks at some of those slides, one feels that we have not really gone very far. On that small horse-power and with the very crude knowledge that they had of the details, what a wonderful performance the Wright brothers put up! The basic methods of control which they used, are still the methods which we are using to-day. We have not fundamentally altered them in any way. But perhaps in air transport to-day we are expressing more truly what the Wright brothers were after, than in some other ways in which we have seen aviation used in recent years. This year, air transport throughout the world will be carrying something like 50 million passengers. To-morrow on our own particular airline we shall have approximately 5,000 people in the air, and we are hoping to hand to each of them a little souvenir to remind them that only fifty years ago the first man left the ground. It is a great thing still to have with us people, like Colonel Ogilvie, who moved and worked with the Wrights in those legendary days.

We have not moved forward in every direction. Our take-off is, I think, a good deal cruder than the Wrights' simple form of take-off. We need acres and acres of concrete to-day. In the next fifty years I hope we shall conquer that great objection to air transport, of sterilizing acres of ground before we can move into the air. I believe that we shall make all those great acres of airports redundant fifty years from now.

The last thing I should like to say is that in aviation we have been moving fast and thinking ahead, but only now are we beginning to build up a tradition like the tradition which belongs to other branches of science and engineering. We are only now starting to build up this tradition, and it is nice to know that the pioneering names—many British among them—are at last being recognized and being written

in letters of gold. It reminds one of these words of Stephen Spender speaking of people

'who travelled a brief while towards the sun,
And left the vivid air signed with their honour'.

THE CHAIRMAN: There are two others I should have liked to call on, but they have had to go. One is the great pioneer with the machine we have seen described, Sir Francis Maclean. The other is Sir Frederick Sykes, who saw from the first the immense potential of flying from the transport as well as the defence point of view. He planned the organization of naval and military wings developing from the Royal Balloon Corps. These became the Royal Naval Air Service and the Royal Flying Corps, many years later to be the Royal Air Force, of which he is in fact the grandfather.

Before I ask you to show your warm appreciation of Captain Pritchard, I would like, on behalf of the aeronautical community, to thank the Royal Society of Arts, and in particular my very old friend Sir Edward Crowe, one of the Society's Past Presidents, for convening this gathering.

We have all justly praised Captain Pritchard; he has done this job in a really remarkable way. He has paid a very great, true and heartfelt tribute to the Wright brothers.

The vote of thanks to the Lecturer was carried with acclamation; and, another having been accorded to the Chairman, the meeting then ended.

GENERAL NOTES

FREE EVENING LECTURES AT THE V. & A.

The second series of free evening lectures which are being given at the Victoria & Albert Museum this winter, on Wednesdays at 6.15 p.m., begins on 13th January. The series will include three lectures on 'Meaning and Symbol in William Blake', to be given by George Wingfield Digby (3rd, 10th and 17th February); a lecture on 'The Royal Plate from Buckingham Palace and Windsor Castle', by Charles Oman (24th February); and a lecture on 'Osterley Park House', by Peter Ward-Jackson (31st March).

No admission tickets are required for any of these lectures, and they will all be given in the Museum Lecture Theatre (entrance in Exhibition Road).

NOTES ON BOOKS

DESIGN AND ARCHITECTURE IN THE HOME. *Noel Carrington. Batsford*, 1952. 30*s*

This book is a revised, enlarged and more up-to-date version of a previous work by the same author. It is primarily a picture book, directed at the layman—or more probably the laywoman—and the text is therefore rather superficial in content and cosy in style. The three hundred or so illustrations cover most things from furnished rooms to soap dishes, and from washing machines to wallpapers. Many of them are 'Britain Can Make It' in period, and none of them will be unfamiliar to those who work in the field—or should one say in these parsimonious days, the allotment?—of interior design.

Mr. Carrington has managed to assemble a fair cross-section of the best available work in the immediate post-war years, and his book is handsomely produced, but too many pages are wasted on photographs of fabrics and papers which are surely quite meaningless without colour, and the price is inexcusably high for a volume

which is in fact no more than a solidified magazine. Publishing and printing is to-day so long a process that it is probably unwise to imprison in such permanent form material which tends to become so rapidly out of date, and is, in fact, being far more effectively recorded by *Design Review* at the Council of Industrial Design.

HUGH CASSON

SHORT NOTES ON OTHER BOOKS

MAKING POTTERY FIGURES. *By Marjorie Drawbell. Studio publications*, 1953. 15*s*

This addition to the *How to do it* series is intended for those who already have some knowledge of modelling and casting, and who wish to learn how to reproduce their work. All stages of the process from the modelling of a figure, which will be suitable for casting to its final decoration, are described and illustrated.

PLANT GROWTH SUBSTANCES. *By L. J. Andus. Leonard Hill*, 1953. 42*s*

The chemicals, both natural and synthetic, which are now known to control plant growth, and their varying effects, are described, and this description is followed by an account of the ways in which their stimulating or inhibiting properties, on plant or fruit, may be used by the nurseryman.

A BRIEF ACCOUNT OF BRYAN DONKIN, F.R.S., AND OF THE COMPANY HE FOUNDED 150 YEARS AGO. *Bryan Donkin Company Limited*, 1953.

The remarkable versatility of Bryan Donkin, whose inventions and productions ranged from a revolution counter and a tachometer, for each of which this Society awarded him a Gold Medal, to canned food, paper-making machinery, and steel pens, is here described, and followed by an account of his company's activities to the present day.

TRUSTS AND FOUNDATIONS. *Compiled by Guy W. Keeling. Cambridge, Bowes & Bowes*, 1953. 42*s*

The need for more information about charitable trusts is in part met by this book, described in its sub-title as 'A select guide to organizations and grant-making bodies operating in Great Britain and the Commonwealth'. It lists in alphabetical order some thousand such bodies, with a classified index and alphabetical subject index, an appendix on government grants to voluntary agencies, and a bibliography.

FROM THE JOURNAL OF 1854

VOLUME II. *6th January*, 1854

PREVENTION OF SMOKE

Following recent discussions at the Society's meetings on the smoke nuisance, the Secretary had received several communications on this subject. One correspondent, Mr. Henry W. Reveley,

'does not think that even an Act of Parliament for the prevention of smoke will have any tendency to remove this crying evil (the smoke cloud). By far the largest portion of the London smoke is the result of imperfect combustion in our household fires; the factories and steam-engines, with the exception of sundry local nuisances, having little to do with it'. Neither does he think it possible 'to remove or lessen this nuisance by any patented expedient, for it is the direct interest of the

patentee to make his invention as expensive and complicated as possible, in the first place for profit and, in the second, for the purpose of obtaining security from piracy'. In fact, he sees no remedy that might tend to remove or mitigate this opprobium of London, 'unless it be by some system of taxation, as recommended by Mr. W. Bridges Adams'. He differs, however, from that gentleman in the mode, because 'the imposition of a new tax is unpleasant, whereas, a remission of some portion of the house, or other more appropriate duty, in all cases where the chimney tops of any building or factory never emitted any black smoke, would be hailed with delight. By the same rule, I would remit all duties upon coke brought to London, as well as upon every other kind of non-producing smoke fuel, but even with such fuel it must be constantly borne in mind, that a badly constructed furnace, or chimney, throws out much greater quantities of deleterious gas than one of a good construction'.

Some Activities of Other Societies and Organizations

MEETINGS

SAT. 9 JAN. Horniman Museum, Forest Hill, S.E.23. 3.30 p.m. Mrs. Joy Adamson : *Traditional Customs and Costumes of Some Kenya Tribes.*

MON. 11 JAN. Geographical Society, Royal, S.W.7. 8.15 p.m. Ross Salmon : *Among the Tribes of Venezuela and Colombia.*

Transport, Institute of, at Jarvis Hall, 66 Portland Place, W.1. 5.45 p.m. W. M. Little : *Transport in the Municipal Field : Problems of the Day.*

TUES. 12 JAN. Chemical Engineering Group, at the Geological Society, Burlington House, W.1. 5.30 p.m. F. E. Warner, A. M. Cook and D. Train : *Engineering and Microbiological Processes.*

Civil Engineers, Institution of, Great George Street, S.W.1. 5.30 p.m. C. Heyes and E. J. Dickie : *The Control of Aircraft Movement at Airports.*

Japan Society of London, at the Victoria & Albert Museum, S.W.7. 5.30 p.m. K. S. Bovey : *Lafcadio Hearn and Japan.*

Manchester Geographical Society, 16 St. Mary's Parsonage, Manchester, 3. 6.30 p.m. Mrs. H. G. Steers : *The National Schools of Geography.*

Mechanical Engineers, Institution of, Storey's Gate, S.W.1. 5.30 p.m. Prof. Hans List : *Two-stroke Automotive Compression-ignition Engines.*

Purchasing Officers Association, at the Royal Society of Arts, W.C.2. 6.30 p.m. H. F. Barnes : *Temperature Measuring Instruments, with some reference to Automatic Temperature Control.*

Textile Institute, at the Midland Hotel, Bradford. 7.15 p.m. S. Kershaw : *Experiences on a United Nations Assignment.*

WED. 13 JAN. Electrical Engineers, Institution of, Savoy Place, W.C.2. 5.30 p.m. G. W. Barnes : *A Single-Sideband Controlled-Carrier System for Aircraft Communication.*

Petroleum, Institute of, 26 Portland Place, W.1. 5.30 p.m. C. W. G. Martin and D. R. Bailey : *The Stability and Compatibility of Fuel Oil and Diesel Fuel.*

Sanitary Institute, Royal, 90 Buckingham Palace Road, S.W.1. 2.30 p.m. *Slums : Clearance and Improvement* (Discussion).

Textile Institute, at the Chemical Society, Burlington House, W.1. 7 p.m. *The Place of Standards in the Textile Industry* (Discussion).

THURS. 14 JAN. Textile Institute, at the Blackburn Municipal Technical College. 7.15 p.m. E. Race: *The Manufacture of Paper Makers' Felts.*

FRI. 15 JAN. British Sound Recording Association, at the Royal Society of Arts, W.C.2. 7 p.m. D. J. W. Seagrove : *The Violin : its Tonal Variations and Peculiarities.*

Mechanical Engineers, Institution of, Storey's Gate, S.W.1. 5.30 p.m. T. W. F. Brown : *High Temperature Steam and Gas Turbine Machinery for Marine Propulsion.*

Navigation, Institute of, at the Royal Geographical Society, S.W.7. 5 p.m. *Methods of Air and Surface Navigation.*

SAT. 16 JAN. Horniman Museum, Forest Hill, S.E.23. 3.30 p.m. W. J. L. Sladen : *Penguins of the Antarctic.*

MON. 18 JAN. Electrical Engineers, Institution of, Savoy Place, W.C.2. 5.30 p.m. *The Role of the Consulting Engineer* (Discussion).

TUES. 19 JAN. British Architects, Royal Institute of, 66 Portland Place, W.1. 6 p.m. H. F. Broughton : *Building Economics and Builders' Plant.*

Civil Engineers, Institution of, Great George Street, S.W.1. 5.30 p.m. Maj.-Gen. G. N. Tuck : *The Engineer's Task in Future Wars.*

Electrical Engineers, Institution of, Savoy Place, W.C.2. 5.30 p.m. *High-Sensitivity Wattmeters* (Discussion).

Manchester Geographical Society, 16 St. Mary's Parsonage, Manchester, 3. 6.30 p.m. T. N. L. Brown : *Rome.*

Refrigeration, Institute of, at the Institution of Mechanical Engineers, Storey's Gate, S.W.1. 5.30 p.m. L. L. Forster : *Steam Jet Refrigeration—Principles, Design, Operation and its Industrial Application.*

Industrial Transport Association, at the Royal Society of Arts, W.C.2. 6.30 p.m. H. T. Ferrier : *The Development and Organisation of Ambulance Transport Services.*

WED. 20 JAN. British Kinematograph Society, at G.B. Theatre, Wardour Street, W.1. 7.15 p.m. J. Halas, Joy Batchelor and Matyas Seiber : *Producing 'Animal Farm'.*

THURS. 21 JAN. Electrical Engineers, Institution of, Savoy Place, W.C.2. 5.30 p.m. A. J. Francis and T. H. Carr : *Electricity in the Wool Textile Industry.*

Road Transport Engineers, Institute of, at the Royal Society of Arts, W.C.2. 6.30 p.m. G. Charlesworth : *Roads and Commercial Transport.*

FRI. 22 JAN. Mechanical Engineers, Institution of, Storey's Gate, S.W.1. 5.30 p.m. R. E. D. Bishop : *On the Graphical Solution of Transient Vibration Problems.*

OTHER ACTIVITIES

WED. 13 JAN. Building Centre, 26 Store Street, W.C.1. 12.45 p.m. Film Show : *Waterworks ; More Than Meets the Eye.*

WED. 20 JAN. Building Centre, 26 Store Street, W.C.1. 12.45 p.m. Film Show : *The Glass Makers ; Making Bricks for Houses ; Cement Stabilized Road Construction.*

NOW UNTIL SUN. 17 JAN. Science Museum, S.W.7. Exhibition : *Navigation To-day.*

NOW UNTIL 23 JAN. Arts Council, at the New Burlington Galleries. Exhibition : *Contemporary Art in Finland.*

NOW UNTIL 7 FEB. Tate Gallery. Exhibition : *Paintings and Drawings by Raoul Dufy.*

NOW UNTIL APR. Victoria & Albert Museum, S.W.7. Exhibition : *Bazaar Paintings from Calcutta.*

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